

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application No. : TO BE ASSIGNED, A DIVISIONAL OF APPLICATION NO. 10/213,091  
FILED AUGUST 7, 2002  
Applicant : JEWELL, JACK L.  
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Title : A LIGHT EMITTING DEVICE  
  
Art Unit : 2828  
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Atty Docket No. : PICO-0047-1

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**INFORMATION DISCLOSURE STATEMENT**

Sir:

Pursuant to 37 C.F.R. §§ 1.51(b), 1.56, 1.97 and 1.98, this Information Disclosure Statement is submitted in the above-identified patent application, which claims the priority date of August 7, 2002, U.S. Patent Application No. 10/213,091. A listing of documents to be published on the face of any patent granted from this application is submitted herewith on Form PTO-1449. Any other documents or information submitted for consideration by the Examiner are listed in this paper. A copy of each U.S. and foreign patent, or each publication or portion thereof listed or herein identified, is submitted herewith, except that a copy of any U.S. patent application identified herein or any patent, publication or other information listed herein cited or submitted in a prior application relied upon for an earlier filing date and identified below, is not submitted herewith.

This Information Disclosure Statement is submitted within three months of (i) the filing date of the above-identified U.S. National Patent application, or (ii) the date of entry into the U.S. National Stage of the above-identified International Application, or (iii) the date of entry into the U.S. National Stage of the International Application that has been assigned the above-identified U.S. Patent application number, whichever applies.

The Examiner is requested to acknowledge consideration of the information provided in this paper in accordance with prescribed procedures.

Please charge any additional fees or credit any overpayments in connection with this paper to **Deposit Account No. 10-0233 PICO-0047-1.**

Respectfully submitted,



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<b>Form PTO 1449</b>  <b>U.S. Department of Commerce</b> <b>Patent and Trademark Office</b>  <b>Information Disclosure Statement by Applicant</b>	<b>ATTY. DOCKET NUMBER</b> <b>PICO-0042-1</b>	<b>SERIAL NUMBER</b> <b>10/213,091</b>
	<b>APPLICANT</b> <b>JEWELL, Jack L.</b>	
	<b>FILING DATE</b> <b>August 7, 2002</b>	<b>GROUP</b> <b>2828</b>

## U.S. Patent Documents

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
		4,144,101	Mar., 1979	Rideout.			
		4,216,036	Aug., 1980	Tsang			
		5,115,441	May, 1992	Kopf, <i>et al.</i>			
		5,115,442	May, 1992	Lee, <i>et al.</i>			
		5,171,703	Dec., 1992	Lin <i>et al.</i>			
		5,179,567	Jan., 1993	Uomi, <i>et al.</i>			
		5,245,622	Sept., 1993	Jewell, <i>et al.</i>			
		5,258,990	Nov., 1993	Olbright, <i>et al.</i>			
		5,262,360	Nov., 1993	Holonyak, Jr. <i>et al.</i>			
		5,327,448	Jul., 1994	Holonyak, Jr. <i>et al.</i>			
		5,337,074	Aug., 1994	Thornton			
		5,354,709	Oct., 1994	Lorenzo <i>et al.</i>			
		5,359,618	Oct., 1994	Lebby <i>et al.</i>			
		5,373,522	Dec., 1994	Holonyak, Jr. <i>et al.</i>			
		5,400,354	Mar., 1995	Ludowise <i>et al.</i>			
		5,403,775	Apr., 1995	Holonyak, Jr. <i>et al.</i>			
		5,416,044	May, 1995	Chino, <i>et al.</i>			
		5,493,577	Feb., 1996	Choquette <i>et al.</i>			
		5,550,081	Aug., 1996	Holonyak, <i>et al.</i>			
		5,557,627	Sep., 1996	Schneider, Jr. <i>et al.</i>			
		5,568,499	Oct., 1996	Lear			
		5,581,571	Dec., 1996	Holonyak, Jr. <i>et al.</i>			
		5,594,751	Jan., 1997	Scott			
		5,633,527	May, 1997	Lear			
		5,659,193	Aug., 1997	Ishigaki.			
		5,719,891	Feb., 1998	Jewell			
		5,719,892	Feb., 1998	Jiang, <i>et al.</i>			
		5,724,374	March, 1998	Jewell			
		5,729,566	March, 1998	Jewell			
		5,739,945	Apr., 1998	Tayebati.			
		5,809,051	Sept., 1998	Oudar			
		5,896,408	April, 1999	Corzine, <i>et al.</i>			
		5,978,408	Nov., 1999	Thornton			

		6,014,395	Jan., 2000	Jewell			
		6,014,395	Jan., 2000	Jewell			
		6,052,399	Apr., 2000	Sun			
		6,069,908	May., 2000	Yuen <i>et al.</i>			
		6,148,016	Nov., 2000	Hegblom <i>et al.</i>			

## Foreign Patent Documents

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
							YES	NO

## Other Documents (Including Author, Title, Date Pertinent Pages, Etc.)

		Babic <i>et al.</i> , "Room-Temperature Continuous-Wave Operation of 1.54-mm Vertical-Cavity Lasers," IEEE Photonics Technology Letters, vol. 7, pp. 1225-1227 (Nov. 1995).
		Blum <i>et al.</i> , "Electrical and Optical Characteristics of AlAsSb/GaAsSb Distributed Bragg Reflectors for Surface Emitting Lasers," Applied Physics Letters, vol. 67, pp. 3233-3235 (Nov. 1995).
		Caracci <i>et al.</i> , "High-Performance Planar Native-Oxide Buried-Mesa Index-Guided AlGaAs-GaAs Quantum Well Heterostructure Lasers," Applied Physics Letters, vol. 61, pp. 321-323 (Jul. 20, 1992).
		Cheng <i>et al.</i> , "Lasing characteristics of high-performance narrow stripe InGaAs-GaAs quantum-well lasers confined by AlAs native oxide," IEEE Photonics Technology Letters, vol. 8, pp. 176-178 (Feb. 1996).
		Choquette <i>et al.</i> , "Cavity Characteristics of Selectively Oxidized Vertical-Cavity Lasers," Applied Physics Letters, vol. 66, pp. 3413-3415 (Jun. 1995).
		Choquette <i>et al.</i> , "Fabrication and Performance of Selectively Oxidized Vertical-Cavity Lasers," IEEE Photonics Technology Letters, vol. 7, pp. 1237-1239 (Nov. 1995).
		Choquette <i>et al.</i> , "Low Threshold Voltage Vertical-Cavity Lasers Fabricated by Selective Oxidation," Electronics Letters, vol. 30, pp. 2043-2044 (Nov. 1994).
		Choquette <i>et al.</i> , "Continuous wave operation of 640-660nm selectively oxidized AlGaInP vertical-cavity lasers," Electronics Letters, vol. 31, pp. 1145-1146 (July 6, 1995).
		Choquette <i>et al.</i> , "Self-pulsing oxide-confined vertical cavity lasers with ultralow operating current," Electronics Letters, vol. 32, pp. 459-460 (Feb. 29, 1996).
		Chua <i>et al.</i> , "Planar Laterally Oxidized Vertical-Cavity Lasers for Low-Threshold High-Density Top-Surface-Emitting Arrays," IEEE Photonics Technology Letters, vol. 9, pp. 1060-1062 (Aug. 1997).
		Chua <i>et al.</i> , "Low-threshold 1.57mm VC-SELs & using strain compensated quantum wells and oxide/metal back mirror," IEEE Photonics Technology Letters, vol. 7, pp. 444-446 (May, 1995).
		Cibert <i>et al.</i> , "Kinetics of Implantation Enhanced Interdiffusion of Ga and Al at GaAs-Ga1-xAlxAs Interfaces," Applied Physics Letters, vol. 49, pp. 223-224 (Jul. 28, 1986).
		Coldren <i>et al.</i> , "Dielectric apertures as intracavity lenses in vertical-cavity lasers," Applied Physics Letters, vol. 68, pp. 313-315 (Jan. 15, 1996).
		Dallesasse <i>et al.</i> , "Hydrolyzation Oxidation of AlxGa1-xAs-AlAs-GaAs Quantum Well Heterostructures and Superlattices," Applied Physics Letters, vol. 57, pp. 2844-2846 (Dec. 1990).
		Dallesasse <i>et al.</i> , "Native-Oxide Masked Impurity-Induced Layer Disordering of AlxGa1-xAs Quantum Well Heterostructures," Applied Physics Letters, vol. 58, pp. 974-976 (Mar. 4, 1991).
		Dallesasse <i>et al.</i> , "Native-Oxide Stripe-Geometry AlxGa1-xAs-GaAs Quantum Well Heterostructure Lasers," Applied Physics Letters, vol. 58, pp. 394-396 (Jan. 28, 1991).
		Dallesasse <i>et al.</i> , "Native-Oxide-Defined Coupled-Stripe AlxGa1-xAs-GaAs Quantum Well Heterostructure Lasers," Applied Physics Letters, vol. 58, pp. 834-836 (Feb. 25, 1991).
		Dallesasse <i>et al.</i> , "Stability of AlAs in AlxGa1-xAs-AlAs-GaAs Quantum Well Heterostructures," Applied Physics Letters, vol. 56, pp. 2436-2438 (June 11, 1990).
		Dapkus <i>et al.</i> , "Ultralow threshold vertical cavity surface emitting lasers," <a href="http://engine.ieee.org/pubs/newsletters/leos/dec95/ultra.htr">http://engine.ieee.org/pubs/newsletters/leos/dec95/ultra.htr</a> , pp. 1-7.

	Deppe <i>et al.</i> , "Very-low-threshold index-confined planar microcavity lasers," IEEE Photonics Technology Letters, vol. 7, pp. 965-967 (Sept. 1995).
	El-Zien <i>et al.</i> , "Native-oxide coupled-cavity Al <sub>x</sub> Ga <sub>1-x</sub> As-AlAs-GaAs quantum well heterostructure laser diodes," Applied Physics Letters, vol. 59, pp. 2838-2840 (Nov. 25, 1991).
	Evans <i>et al.</i> , "Edge-Emitting Quantum Well Heterostructure Laser Diodes with Auxillary Native-Oxide Vertical Confinement," Applied Physics Letters, vol. 67, pp. 3168-3170 (Nov. 1995).
	Floyd <i>et al.</i> , "Scalable etched-pillar, AlAs-oxide defined vertical cavity lasers," Electronics Letters, vol. 32, pp. 114-116 (Jan. 18, 1996).
	Floyd <i>et al.</i> , "Comparison of Optical Losses in Dielectric-Apertured vertical-cavity lasers," IEEE Photonics Technology Letters, vol. 8, pp. 590-592 (May, 1996).
	Giaietta <i>et al.</i> , "A Novel 4x8 Single-Mode Independently Addressable Oxide-Isolated VCSEL Array," IEEE Photonics Technology Letters, vol. 9, pp. 1196-1198 (Sep. 1997).
	Hadley <i>et al.</i> , "Comprehensive numerical modeling of vertical-cavity surface-emitting lasers," IEEE Journal of Quantum Electronics, vol. 32, pp. 607-616 (April, 1996).
	Hayashi <i>et al.</i> , "Record low-threshold index-guided InGaAs/GaAlAs vertical-cavity surface-emitting laser with a native oxide confinement structure," Electronics Letters, vol. 31, pp. 560-562 (March 30, 1995).
	Hayashi <i>et al.</i> , "Lasing characteristics of low-threshold oxide confinement InGaAs-GaAlAs vertical-cavity surface-emitting lasers," IEEE Photonics Technology Letters, vol. 7, pp. 1234-1236 (Nov. 1995).
	Hegblom <i>et al.</i> , "Estimation of scattering losses in dielectrically apertured vertical-cavity lasers," Applied Physics Letters, vol. 68, pp. 1757-1759 (March 25, 1996).
	Huffaker <i>et al.</i> , "Native-oxide defined ring contact for low threshold vertical-cavity lasers," Applied Physics Letters, vol. 65, pp. 97-99 (July 4, 1994).
	Huffaker <i>et al.</i> , "Low threshold half-wave vertical-cavity lasers," Electronics Letters, vol. 30, pp. 1946-1947 (Nov. 10, 1994).
	Huffaker <i>et al.</i> , "Improved mode stability in low threshold single quantum well native-oxide defined vertical-cavity lasers," Applied Physics Letters, vol. 65, pp. 2642-2644 (Nov. 21, 1994).
	Huffaker <i>et al.</i> , "Lasing characteristics of low threshold microcavity lasers using half-wave spacer layers and lateral index confinement," Applied Physics Letters, vol. 66, pp. 1723-1725 (April 3, 1995).
	Huffaker <i>et al.</i> , "Threshold characteristics of planar and index-guided microcavity lasers," Applied Physics Letters, vol. 67, pp. 4-6 (July 3, 1995).
	Huffaker <i>et al.</i> , "Spontaneous coupling to planar and index-confined quasimodes of Fabry-Perot microcavities," Applied Physics Letters, vol. 67, pp. 2594-2596 (Oct. 30, 1995).
	Huffaker <i>et al.</i> , "Fabrication of high-packing-density vertical cavity surface-emitting laser arrays using selective oxidation," IEEE Photonics Technology Letters, vol. 8, pp. 596-598 (May, 1996).
	Jewell <i>et al.</i> , "Surface-Emitting Lasers Break the Resistance Barrier," Photonics Spectra, vol. 27, pp. 126-130 (Nov. 1992).
	Kish <i>et al.</i> , "Native-Oxide Stripe-Geometry In <sub>0.5</sub> (Al <sub>x</sub> Ga <sub>1-x</sub> ) <sub>0.5</sub> P-In <sub>0.5</sub> Ga <sub>0.5</sub> P Heterostructure Laser Diodes," Applied Physics Letters, vol. 59, pp. 354-356 (Jul. 15, 1991).
	Kish <i>et al.</i> , "Dependence on Doping Type (p/n) of the Water Vapor Oxidation of High-Gap Al <sub>x</sub> Ga <sub>1-x</sub> As," Applied Physics Letters, vol. 60, pp. 3165-3167 (Jun. 22, 1992).
	Kish <i>et al.</i> , "Low-Threshold Disorder-Defined Native-Oxide Delineated Buried-Heterostructure Al <sub>x</sub> Ga <sub>1-x</sub> As -GaAs Quantum Well Lasers," Applied Physics Letters, vol. 58, pp. 1765-1767 (Apr. 22, 1991).
	Kish <i>et al.</i> , "Planar Native-Oxide Al <sub>x</sub> Ga <sub>1-x</sub> As -GaAs Quantum Well Heterostructure Laser Diodes," Applied Physics Letters, vol. 58, pp. 1765-1767 (Apr. 22, 1991).
	Koyama <i>et al.</i> , "Wavelength Control of Vertical Cavity Surface-Emitting Lasers by Using Nonplanar MOCVD," IEEE Photonics Technology Letters, vol. 7, pp. 10-12 (Jan. 1995).
	Krames <i>et al.</i> , "Buried-Oxide Rigid-Waveguide InAlAs-InGaAsP (1-1.3mm) Quantum Well Heterostructure Laser Diodes," Applied Physics Letters, vol. 64, pp. 2821-2823 (May 23, 1994).
	Krames <i>et al.</i> , "Deep-Oxide Planar Buried-Heterostructure AlGaAs-GaAs Quantum Well Heterostructure Laser Diodes," Applied Physics Letters, vol. 65, pp. 3221-3223 (Dec. 19, 1994).
	Lear <i>et al.</i> , "Selectively oxidised vertical cavity surface emitting lasers with 50% power conversion efficiency," Electronics Letters, vol. 31, pp.208-209 (Feb. 2, 1995).
	Lear <i>et al.</i> , "Modal analysis of a small surface emitting laser with a selectively oxidized

	waveguide," Applied Physics Letters, vol. 66, pp. 2616-2618 (May 15, 1995).
	Lear <i>et al.</i> , "High frequency modulation of oxide-confined vertical cavity surface emitting lasers," Electronics Letters, vol. 32, pp. 457-458 (Feb. 29, 1996).
	Lear <i>et al.</i> , "Index guiding dependent effects in implant and oxide confined vertical-cavity lasers," IEEE Photonics Technology Letters, vol. 8, pp. 740-742 (June, 1996).
	Lee <i>et al.</i> , "Wet oxidation of AlAs grown by molecular beam epitaxy," Applied Physics Letters, vol. 65, pp. 2717-2719 (November 21, 1994).
	MacDougal <i>et al.</i> , "Ultralow threshold current vertical-cavity surface emitting lasers with AlAs oxide-GaAs distributed bragg reflectors," IEEE Photonics Technology Letters, vol. 7, pp. 229-231 (March, 1995).
	MacDougal <i>et al.</i> , "Electrically-pumped vertical-cavity lasers with Al <sub>x</sub> O <sub>x</sub> -GaAs reflectors," IEEE Photonics Technology Letters, vol. 8, pp. 310-312 (March, 1996).
	MacDougal <i>et al.</i> , "Wide-bandwidth distributed bragg reflectors using oxide/GaAs multilayers," Electronics Letters, vol. 30, pp. 1147-1149 (July 7, 1994).
	Maranowski <i>et al.</i> , "Al <sub>x</sub> Ga <sub>1-x</sub> As -GaAs-In <sub>y</sub> Ga <sub>1-y</sub> As Quantum Well Heterostructure Lasers with Native Oxide Current-Blocking Windows Formed on Metallized Devices," Applied Physics Letters, vol. 64, pp. 2151-2153 (Apr. 18, 1994).
	Maranowski <i>et al.</i> , "Native Oxidized Top- and Bottom-Confined Narrow Stripe p-n AlyGa <sub>1-y</sub> As -GaAs-In <sub>sub.x</sub> Ga <sub>sub.1-x</sub> As Quantum Well Heterostructure Laser," Applied Physics Letters, vol. 63, pp. 1660-1662 (Sep. 20, 1993).
	Ochiai <i>et al.</i> , "Kinetics of thermal oxidation of AlAs in water vapor," Applied Physics Letters, vol. 68, pp. 1898-1900 (April 1, 1996).
	Ries <i>et al.</i> , "Photopumped Room-Temperature Edge- and Vertical-Cavity Operation of AlGaAs-GaAs-InGaAs Quantum Well Heterostructure Lasers Utilizing Native Oxide Mirrors," Applied Physics Letters, vol. 65, pp. 740-742 (Aug. 8, 1994).
	Rogers <i>et al.</i> , "Influence of cavity tuning on the transverse mode in vertical-cavity lasers," IEEE Photonics Technology Letters, vol. 7, pp. 238-240 (March, 1995).
	Sugg <i>et al.</i> , "Native Oxide-Embedded Al <sub>x</sub> Ga <sub>1-x</sub> As -GaAs-In <sub>x</sub> Ga <sub>1-x</sub> As Quantum Well Heterostructure Laser," Applied Physics Letters, vol. 62, pp. 1259-1261 (Mar. 15, 1993).
	Thibeault <i>et al.</i> , "Reduced optical scattering loss in vertical-cavity lasers with thin or tapered oxide apertures," IEEE Lasers and Electro-Optics Society Annual Meeting, Post-Deadline paper PD2.1, (Oct. 30 - Nov. 2, 1995).
	Thibeault <i>et al.</i> , "Reduced optical scattering loss in vertical-cavity lasers using a thin (300+) oxide aperture," IEEE Photonics Technology Letters, vol. 8, pp. 593-595 (May, 1996).
	Yang <i>et al.</i> , "Ultralow threshold VCSELs fabricated by selective oxidation from all epitaxial structure," Conference on Lasers and Electro-Optics, Post-Deadline paper CPD4, (May, 1995).
	Yang <i>et al.</i> , "Ultralow threshold vertical-cavity surface-emitting lasers obtained with selective oxidation," Electronics Letters, vol. 13, pp. 886-888, (May 25, 1995).
	Yang <i>et al.</i> , "Influence of mirror reflectivity on laser performance of very-low-threshold vertical-cavity surface emitting lasers," IEEE Photonics Technology Letters, vol. 7, pp. 1228-1230 (Nov. 1995).
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